RELATIVE DATING ACTIVITY

1. Directions: Read the passage below.

INTRODUCTION

Scientists have good evidence that the earth is very old, approximately four and one-half billion years old. Scientists use direct evidence from observations of the rock layers themselves to help determine the **relative age** of rock layers. Specific rock formations are indicative (serving as a sign) of a particular type of environment existing when the rock was being formed. For example, most limestones represent marine (ocean) environments, whereas, sandstones with ripple marks might indicate a shoreline or a riverbed.

The study and comparison of exposed rock layers in various parts of the earth led scientists in the early 19th century to propose that the rock layers could be correlated (having a mutual relationship or connection) from place to place. Locally, physical characteristics of rocks can be compared and correlated. On a larger scale, even between continents, fossil evidence can help in correlating rock layers. **The Principle of Superposition**, which states that in a layer of rocks, the oldest rock layers will be on the bottom, with younger rocks on top of these, helps geologists correlate rock layers around the world. This also means that fossils found in the lowest levels in a sequence of layered rocks represent the oldest record of life there. By matching partial sequences, the truly oldest layers with fossils can be worked out.

By correlating fossils from various parts of the world, scientists are able to give relative ages to particular layers. This is called relative dating. Relative dating tells scientists if a rock layer is "older" or "younger" than another. This would also mean that fossils found in the deepest layer of rocks in an area would represent the oldest forms of life in that particular rock formation. In reading earth history, these layers would be "read" from bottom to top or oldest to most recent. If certain fossils are typically found only in a particular rock unit and are found in many places worldwide, they may be useful as **index or guide fossils** in determining the age of undated layers. By using this information from rock formations in various parts of the world and correlating the studies, scientists have been able to establish the geologic time scale. This relative time scale divides the vast amount of earth history into various sections based on geological events (sea encroachments, mountain-building, and depositional events), and notable biological events (appearance, relative abundance, or extinction of certain life forms).

2. Directions: Double check that you have all of the materials necessary to begin the activity.

Materials: one set of sequence cards in random order, pencil, paper

3. Directions: Attempt to follow Procedure A and answer the interpretation questions on a separate piece of paper to be collected by Ms. Chica. Re-state the questions and answer in a complete sentence.

Procedure Set A:

1) Spread the cards with the nonsense syllables on the table and determine the correct sequence of the eight cards by comparing letters that are common to individual cards and, therefore, overlap. The first card in the sequence has "Card 1, Set A" in the lower left-hand corner and represents the bottom of the sequence. If the letters "T" and "C" represent fossils in the oldest rock layer, they are the oldest fossils, or the first fossils formed in the past for this sequence of rock layers.

2. Now, look for a card that has either a "T" or "C" written on it. Since this card has a common letter with the first card, it must go on top of the "TC" card. The fossils represented by the letters on this card are "younger" than the "T" or "C" fossils on the "TC" card which represents fossils in the oldest rock layer. Sequence the remaining cards by using the same process. When you finish, you should have a vertical stack of cards with the top card representing the youngest fossils of this rock sequence and the "TC" card at the bottom of the stack representing the oldest fossils.

Interpretation Questions:

1) After you have arranged the cards in order, write your sequence of letters (using each letter only once) on a separate piece of paper. Starting with the top card, the letters should be in order from youngest to oldest.
2) How do you know that "X" is older than "M"?
3) Explain why "D" in the rock layer represented by DM is the same age as "M."
4) Explain why "D" in the rock layer represented by OXD is older than "D" in the rock layer represented by DM.

4. Directions: Continue on to Procedure B. Answer the interpretation questions the piece of paper to be collected by Ms. Chica. Re-state the questions and answer in a complete sentence.

Procedure Set B:

1) Carefully examine the second set of cards which have sketches of fossils on them. Each card represents a particular rock layer with a collection of fossils that are found in that particular rock layers. All of the fossils represented would be found in sedimentary rocks of marine origin. gives some background information on the individual fossils. Look at Figure 2-A for more information about each fossil. Figure 2-A

2) The oldest rock layer is marked with the letter "M" in the lower left-hand corner. The letters on the other cards have no significance to the sequencing procedure and should be ignored at this time. Find a rock layer that has at least one of the fossils you found in the oldest rock layer. This rock layer would be younger as indicated by the appearance of new fossils in the rock stratum. Keep in mind that extinction is forever. Once an organism disappears from the sequence it cannot reappear later. Use this information to sequence the cards in a vertical stack of fossils in rock strata. Arrange them from oldest to youngest with the oldest layer on the bottom and the youngest on top.

Interpretation Questions:

5) Using the letters printed in the lower left-hand corner of each card, write the sequence of letters from the youngest layer to the oldest layer (i.e., from the top of the vertical stack to the bottom). This will enable your teacher to quickly check whether you have the correct sequence.

6) In what kinds of rocks might you find the fossils from this activity?

7) State the Principle of Superposition and explain how this activity illustrates this law.

Challenge 8) Which fossil organisms could possibly be used as index fossils?
Challenge 9) List three organisms represented that probably could not be used as index fossils and explain why.